

FCC - TEST REPORT

Report Number : **64.790.15.00707.01** Date of Issue: 2015-03-24

Model : M251022CR

Product Type : Display module with IC card reader

Applicant : ABB Genway Xiamen Electrical Equipment Co.,Ltd

Address : Room 501-1, No.12-14, 3rd Chuang Xin Road, Torch High Technology Development Zone, Xiamen S.E.Z, Fujian Province, P.R.China

Production Facility : ABB Genway Xiamen Electrical Equipment Co.,Ltd

Address : NO.7 Fangshan South Road, Torch High Technology Development Zone (Xiang An) Industrial Zone, Xiamen S.E.Z, Fujian Province, P.R.China

Test Result : ☒ **Positive** ☐ **Negative**



Total pages including Appendices : 29

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration Number: 502708
IC Registration Number: 10320A

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

Test Site 2

Company name: Guangzhou GRG Metrology And Test Technology LTD.
No.163 PingYun Road, West of HuangPu Road, GuangZhou, Guangdong,
P.R.China

Telephone: 86 20 38699960
Fax: 86 20 38695185
FCC Registration Number: 688188
IC Registration Number: 8355A-1

3 Description of the Equipment Under Test

Product:	Display module with IC card reader
Model no.:	M251022CR
FCC ID:	2AEBL-M251022CR
Brand Name:	ABB
Options and accessories:	N/A
Rating:	Input: DC 5V
RF Transmission Frequency:	13.56MHz
Modulation:	ASK
Antenna Type:	PCB layout loop antenna
Description of the EUT:	EUT is a card reader module, it can be grouped with other modules to act as a part of door entry system.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 4 November 2014	General Requirements for Compliance of Radio Apparatus
RSS-210 Issue 8 December 2010	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

All the test methods were according to ANSI C63.4 (2014).

5 Summary of Test Results

Technical Requirements					
Test Condition			Pages	Test Site	Test Result
FCC Rules	RSS Requirements	Test Item	10	2	P
§15.207	RSS-Gen Issue 4 clause 8.8	Conducted emission AC power port			
§15.225(a), (b), (c), (d), 15.209, 15.205	RSS-210 Issue 8 A2.6(a), (b), (c), (d), RSS-Gen Issue 4 clause 8.10	Filed Strength Measurement	15	1	P
§15.225 (e)	RSS-210 Issue 8 A2.6(e)	Frequency Stability	18	1	P
§15.215(c)	RSS-Gen Issue 4 clause 6.6	Occupied Bandwidth	19	1	P

Note 1: N/A=Not Applicable.

6 General Remarks

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: 2015-03-15

Testing Start Date: 2015-03-18

Testing End Date: 2015-03-31

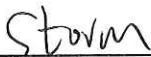
- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

Reviewed by: EMC Project Manager

Prepared by: EMC Project Engineer



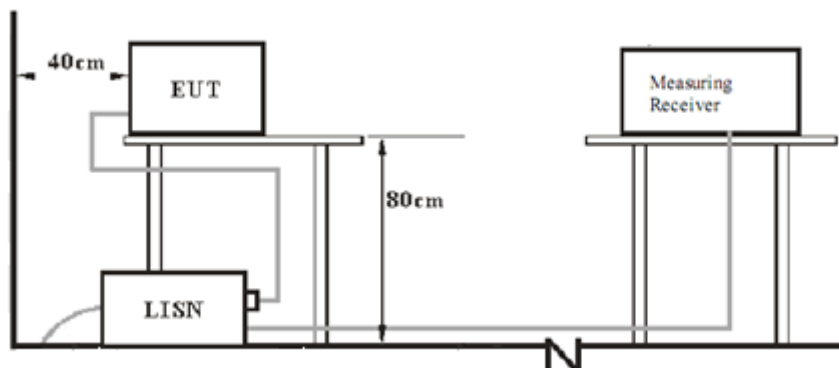
Tony Liu



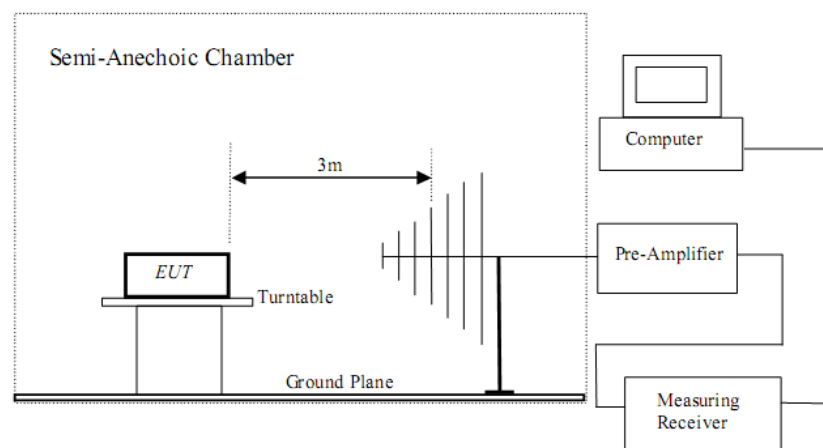
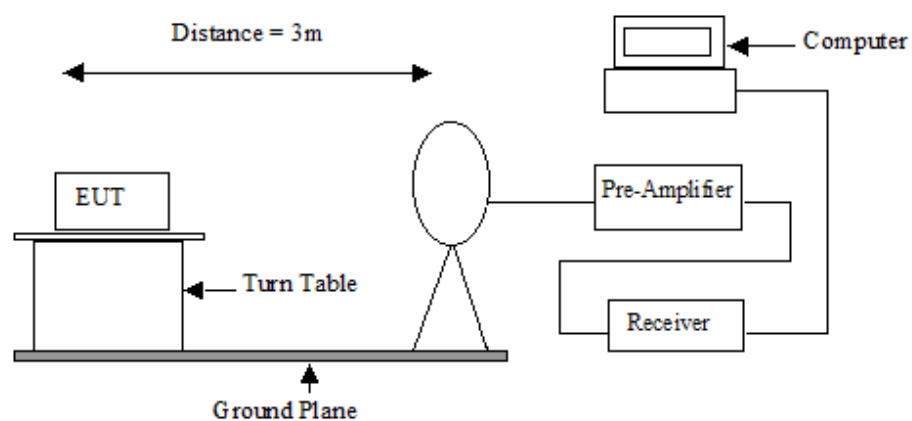
Storm Shu

7 Test Setups

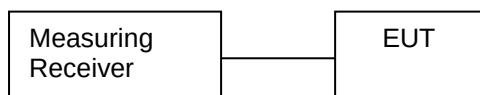
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



8 Test Methodology

8.1 Conducted Emission

The EUT was placed on a table, which is 0.8m above ground plane, the power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).

Maximum procedure was performed to ensure EUT compliance, A EMI test receiver is used to test the emissions from both sides of AC line.

8.2 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules.

8.3 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + \text{System Factor}$$

$$\text{System Factor} = AF + CF + FA - PA$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	REMARK
System controller	ABB	M2300	Input: 100-240 V a.c., 50/60 Hz, 1.0 A; output: 28.0 V d.c., 1.2 A
Camera module	ABB	M251021C	Input: 20-30 V d.c., 3W
Audio module	ABB	M251021A-.	Input: 20-30 V d.c., 4W
Keypad module	ABB	M251021K-.	Input: 20-30 V d.c., 0.5W

Remark: All the auxiliary equipments are used to make this "Display module with IC card reader" works as its representative configuration for conducted emission test.

10 Technical Requirement

10.1 Conducted Emission Measurement

Test Requirement:

FCC part 15 section 15.207
RSS-Gen Issue 4 section 8.8

Limits of 15.207:

Frequency (MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Method:

ANSI C63.4:2014

Test Date:

2015-03-31

Mode of Operation:

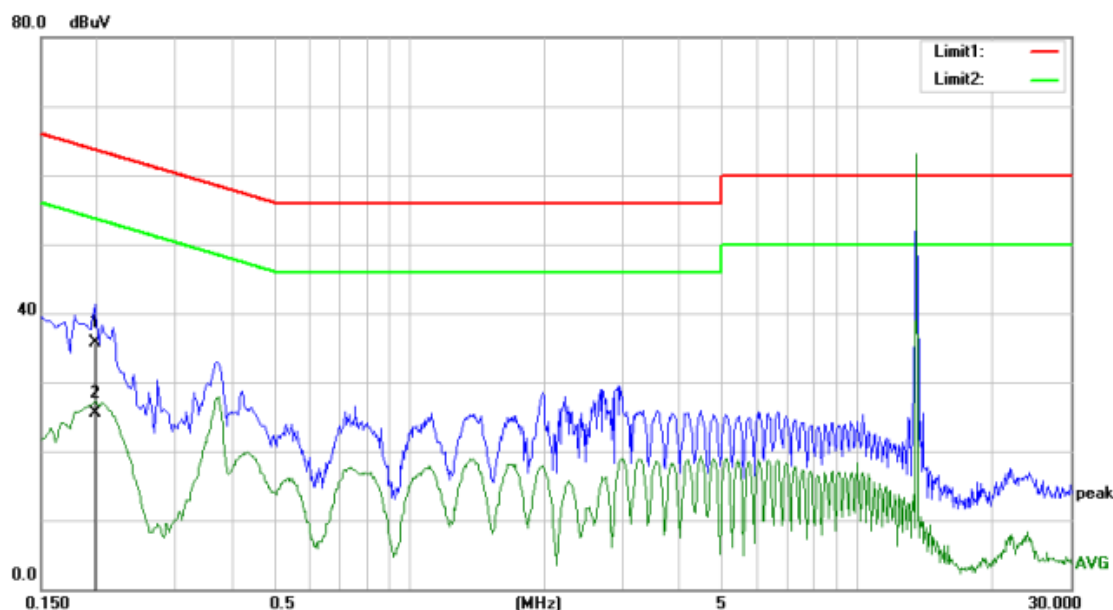
Test EUT in a representative configuration that can read card.

Detector Function

Quasi-peak and Average

Test data:

Conducted emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB	dBuV	dBuV	dB	
1	*	0.1980	29.31	6.49	35.80	63.69	-27.89	QP
2		0.1980	19.11	6.49	25.60	53.69	-28.09	AVG

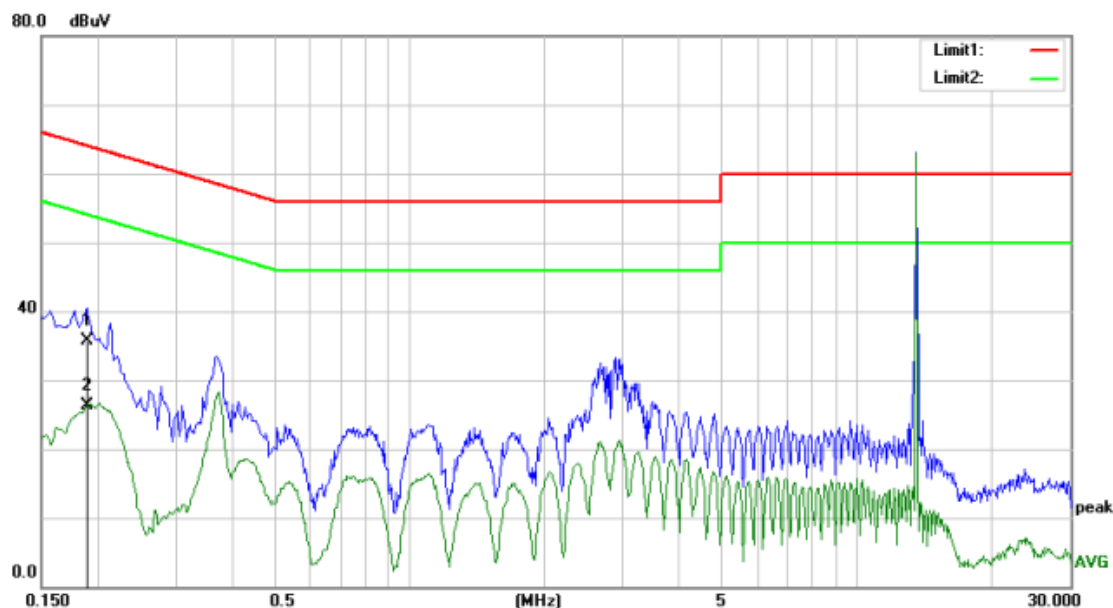
Operating Mode : Test EUT in a representative configuration with the permanent antenna.

Conduct Line/Port : L

Test By : Storm Shu

Test Date : 2015-03-31

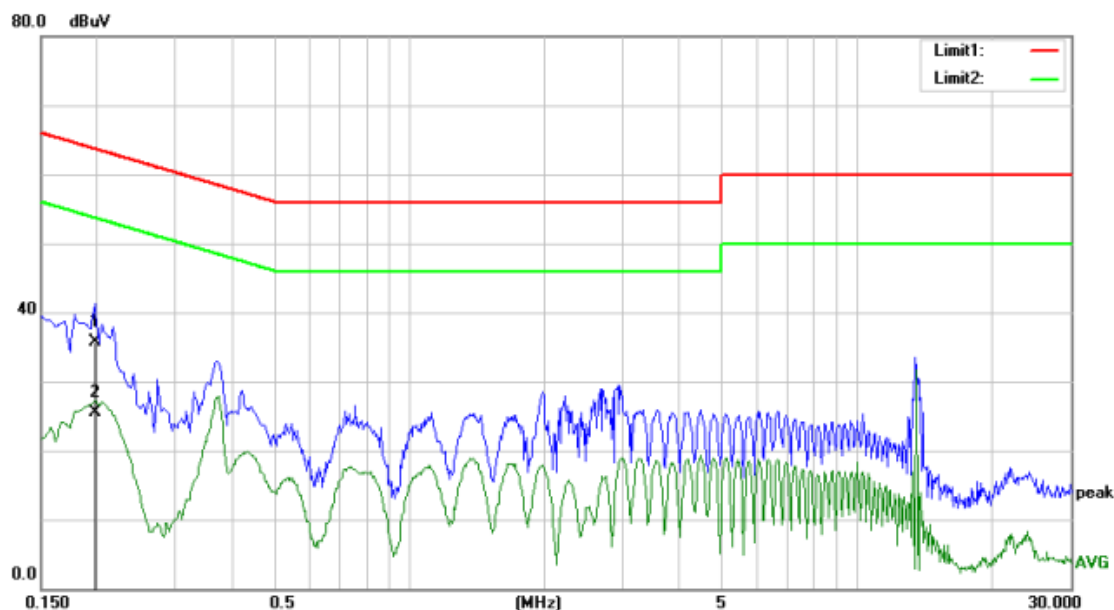
Conducted emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1900	29.29	6.51	35.80	64.03	-28.23	QP
2	*	0.1900	19.89	6.51	26.40	54.03	-27.63	AVG

Operating Mode : Test EUT in a representative configuration with the permanent antenna.
Conduct Line/Port : N
Test By : Storm Shu
Test Date : 2015-03-31

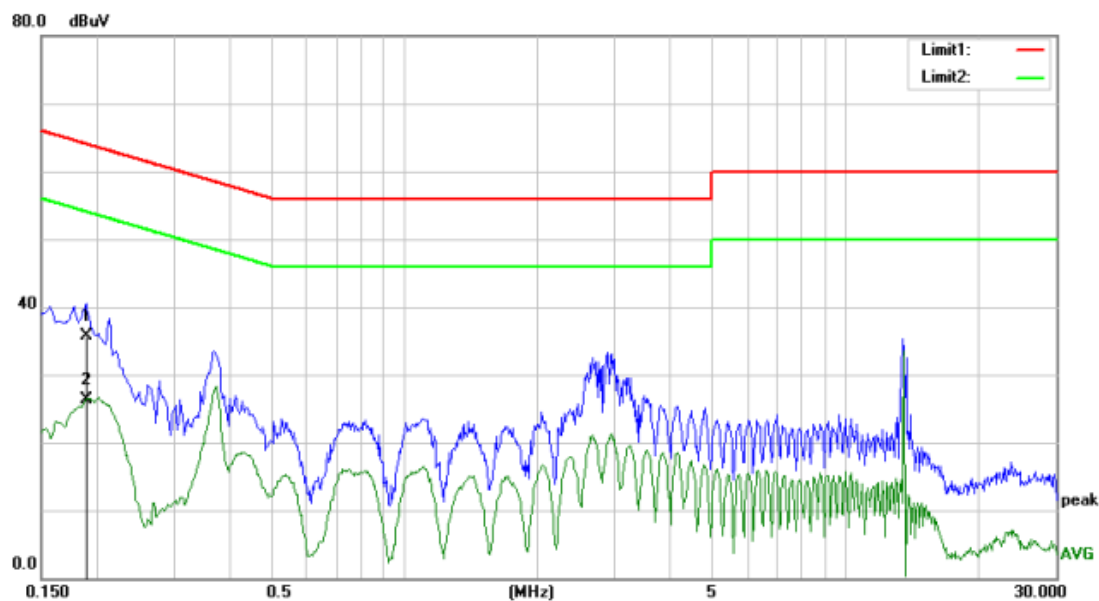
Conducted emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1	*	0.1980	29.31	6.49	35.80	63.69	-27.89	QP
2		0.1980	19.11	6.49	25.60	53.69	-28.09	AVG

Operating Mode : Test EUT in a representative configuration with a dummy load in lieu of the permanent antenna.
 Conduct Line/Port : L
 Test By : Storm Shu
 Test Date : 2015-03-31

Conducted emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1900	29.29	6.51	35.80	64.03	-28.23	QP
2	*	0.1900	19.89	6.51	26.40	54.03	-27.63	AVG

Operating Mode : Test EUT in a representative configuration with a dummy load in lieu of the permanent antenna.
Conduct Line/Port : N
Test By : Storm Shu
Test Date : 2015-03-31

Test result: PASS

10.2 Filed Strength Measurement

Test Requirement:

FCC part 15 section 15.225 (a),(b),(c),(d), 15.205 & RSS 210 Issue 8 A2.6 (a),(b),(c),(d)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Limits of 15.209:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88–216	150	3
216–960	200	3
Above 960	500	3

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Method:

ANSI C63.4:2014

Test Date:

2015-03-20

Mode of Operation:

Continuously transmitting mode.

Detector Function

Quasi-peak (Below 1000 MHz)
Average and Peak (Above 1000 MHz)

Measurement BW

200Hz(9KHz-150KHz)
9KHz(150KHz-30MHz)
120 kHz (30MHz-1000 MHz)
1 MHz (Above 1000 MHz)

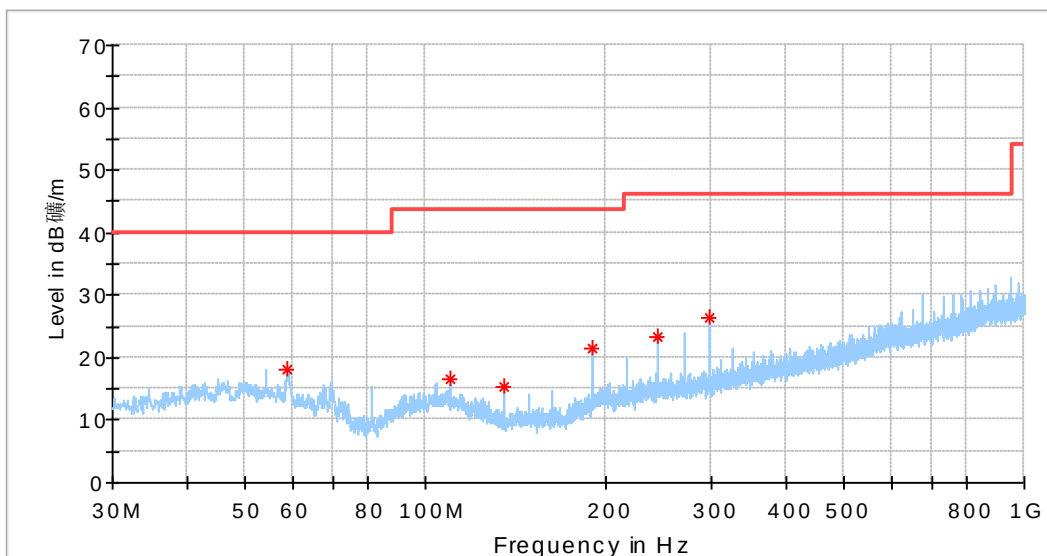
Test data:

Emission 9KHz-30MHz

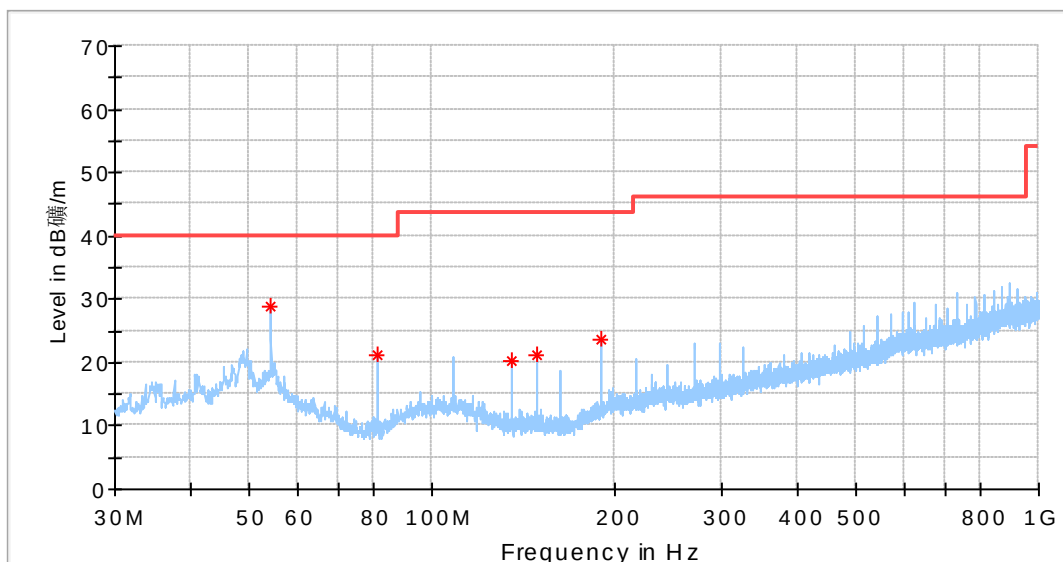
Frequency (MHz)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
0.009423	85.85	148.10	62.26	H	20.5	Peak
13.062386	29.99	69.50	39.51	H	20.0	QP
13.152841	28.27	80.50	52.23	H	20.0	QP
13.207114	28.50	80.50	52.00	H	20.0	QP
13.487523	41.26	90.50	49.24	H	20.0	QP
13.523705	47.26	90.50	43.24	H	20.0	QP
13.546318	51.28	90.50	39.22	H	20.0	QP
13.562809	62.26	123.90	61.64	H	20.0	QP
13.573455	60.90	90.50	29.60	H	20.0	QP
13.600591	55.69	90.50	34.81	H	20.0	QP
13.632250	52.24	90.50	38.26	H	20.0	QP
13.686523	44.44	90.50	46.06	H	20.0	QP
13.745318	34.78	80.50	45.72	H	20.0	QP
13.962409	25.59	80.50	54.91	H	20.0	QP

Frequency (MHz)	Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)	Remark
0.009423	86.66	148.10	61.44	V	20.5	Peak
0.010974	85.74	146.78	61.04	V	20.5	Peak
13.170932	30.93	80.50	49.57	V	20.0	QP
13.198068	29.34	80.50	51.16	V	20.0	QP
13.234250	29.05	80.50	51.45	V	20.0	QP
13.320182	30.17	80.50	50.33	V	20.0	QP
13.501091	31.82	90.50	58.68	V	20.0	QP
13.541796	36.10	90.50	54.40	V	20.0	QP
13.564409	51.06	123.90	72.84	V	20.0	QP
13.605114	41.78	90.50	48.72	V	20.0	QP
13.623205	41.94	90.50	48.56	V	20.0	QP
13.663909	35.66	90.50	54.84	V	20.0	QP
13.677477	36.20	90.50	54.30	V	20.0	QP
13.718182	28.81	80.50	51.69	V	20.0	QP
13.890046	28.35	80.50	52.15	V	20.0	QP
14.003114	27.61	80.50	52.89	V	20.0	QP

Emission 30MHz -1GHz



Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
58.675625	18.02	40.00	21.98	H	14.1
109.782500	16.60	43.50	26.90	H	13.7
135.608750	15.35	43.50	28.15	H	10.4
189.868125	21.45	43.50	22.05	H	12.6
244.127500	23.27	46.00	22.73	H	14.4
298.386875	26.50	46.00	19.50	H	15.6



Frequency (MHz)	QP (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB)
54.250000	28.80	40.00	11.20	V	14.9
81.349375	21.27	40.00	18.73	V	9.8
135.608750	20.30	43.50	23.20	V	10.4
149.188750	21.25	43.50	22.25	V	10.2
189.868125	23.68	43.50	19.82	V	12.6

Test result: PASS

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10.3 Frequency Stability

Test Requirement:	FCC Part 15 C Section 15.225(e) RSS-210 Issue 8 A2.6(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
Test Method:	ANSI C63.4:2014
Test Date:	2015-03-18
Mode of Operation:	Continuously transmitting mode.
Detector Function	Maxpeak
Measurement BW	RBW:10Hz VBW:30Hz

Test data:

Nominal Operating Frequency: 13.563MHz,
Limit: within +/- 1.3563KHz of the operating frequency.

Frequency stability vs. temperature		
Temperature (°C)	Measured Frequency (MHz)	Frequency error (KHz)
50	13.562844800	0.1552
40	13.562842800	0.1572
30	13.562844800	0.1552
20	13.562844800	0.1552
10	13.562842800	0.1572
0	13.562842800	0.1572
-10	13.562844800	0.1552
-20	13.562844800	0.1552

Frequency stability vs. voltage		
Voltage (VDC)	Measured Frequency (MHz)	Frequency error (KHz)
4.25	13.562854800	0.1452
4.5	13.562844800	0.1552
4.75	13.562844800	0.1552
5.0	13.562844800	0.1552
5.25	13.562844800	0.1552
5.5	13.562844800	0.1552
5.75	13.562842800	0.1572

Result: PASS

10.4 Occupied Bandwidth

Test Requirement:

FCC Part 15 C Section 15.215 (c)

RSS-Gen Issue 4 section 6.6

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Method:

ANSI C63.4:2014

Test Date:

2015-03-18

Mode of Operation:

Continuously transmitting mode.

Detector Function

Maxpeak

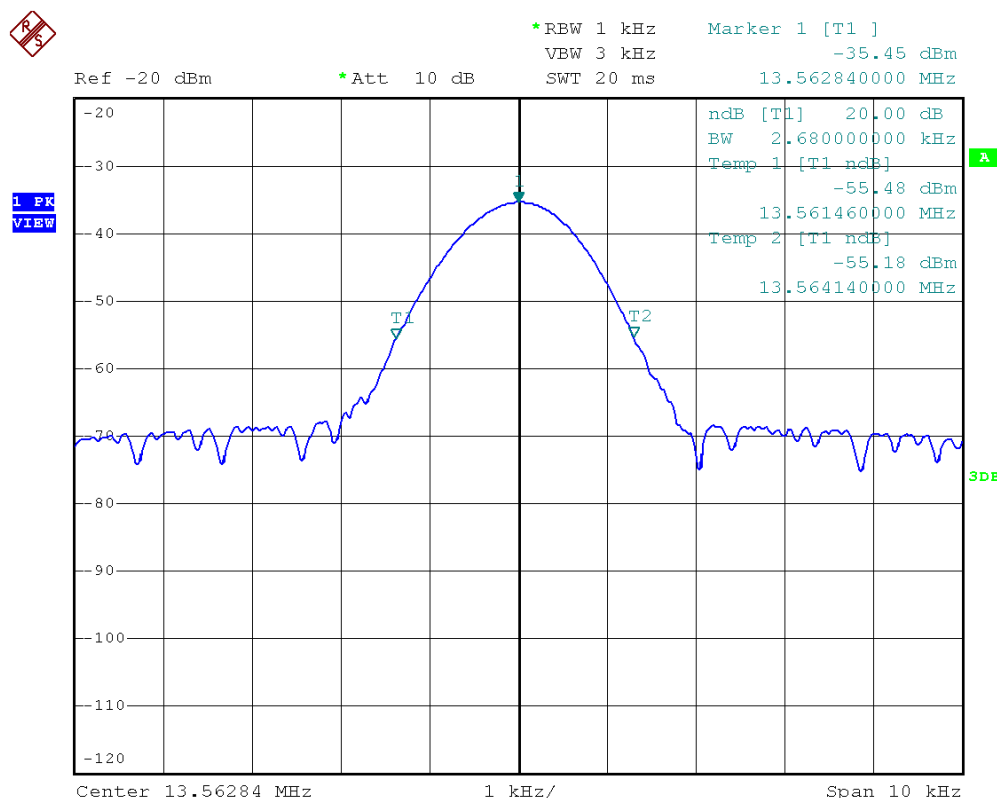
Measurement BW

RBW:1KHz

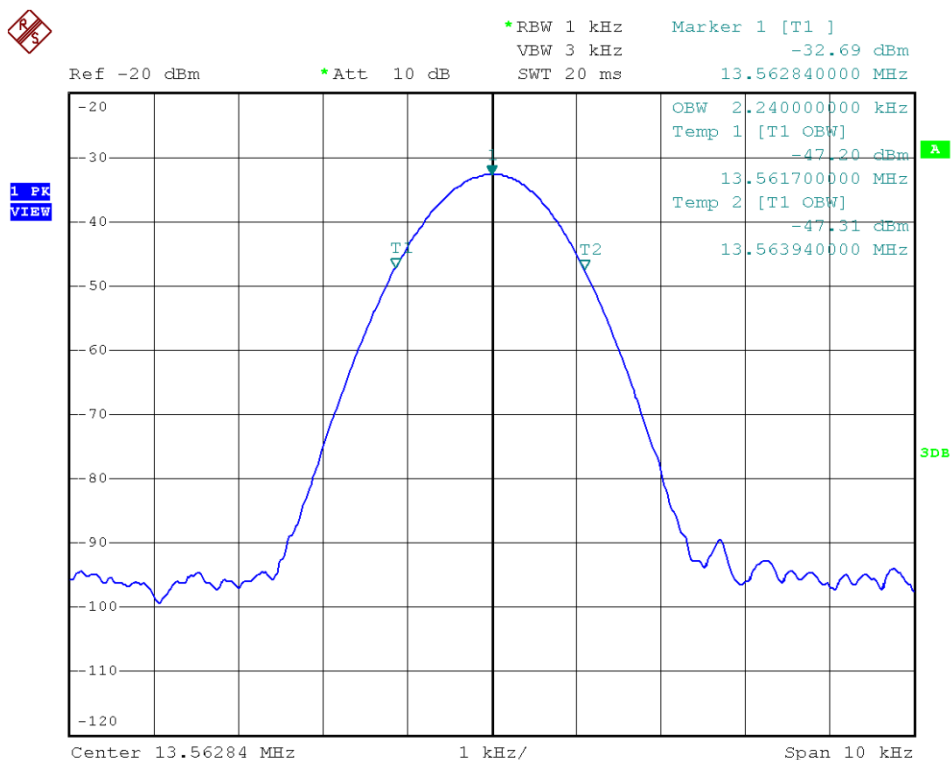
VBW:3KHz

Test data:

20dB bandwidth:



99% bandwidth



Result: PASS

11 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
C	Signal Analyzer	Rohde & Schwarz	FSV40	101031	2015-8-17
	Programmable temperature and humidity chamber	MHG-408CASI	TaiLi	A81002	2015-8-17
	DC power supply	INSTEK	GPR-30600	EH873394	N/A
CE	EMI Receiver	Rohde & Schwarz	ESCI	100529	2015-7-21
	L.I.S.N (single phase)	SCHWARZBECK	NSLK 8127	8127450	2015-8-21
RE	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2017-8-17
	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2015-8-17
	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2017-8-17
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2015-8-17
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Occupied bandwidth
- Frequency Stability

12 System Measurement Uncertainty

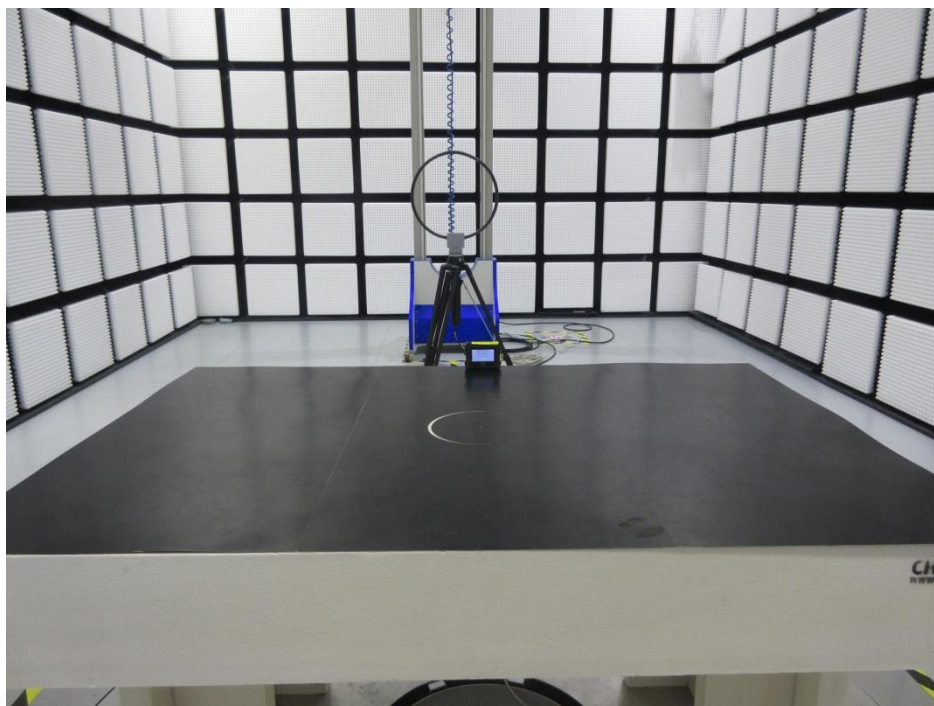
For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

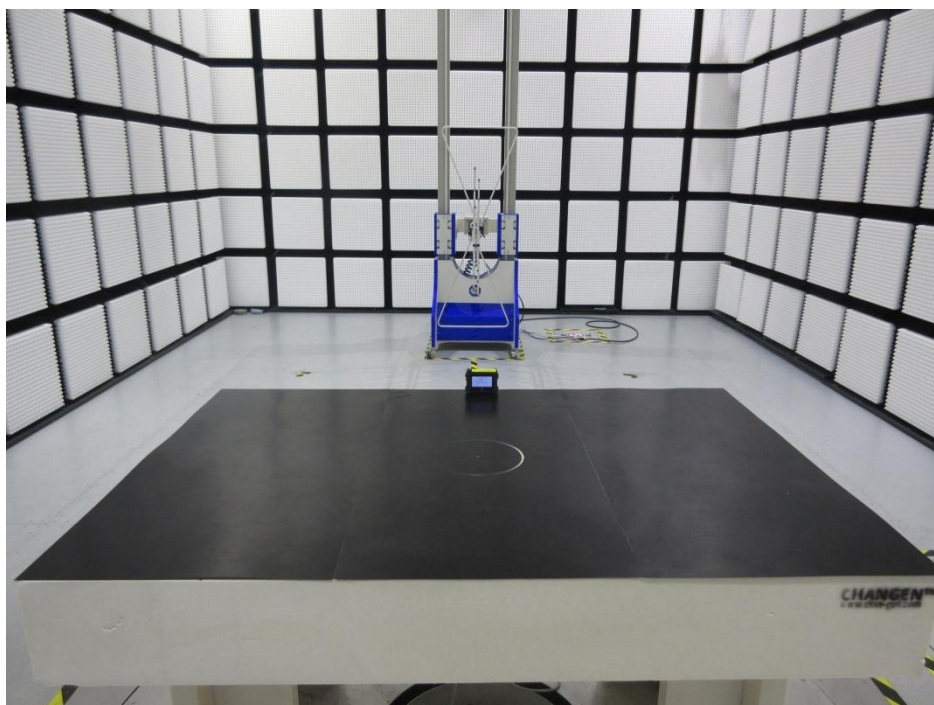
Items	Extended Uncertainty
Radiated spurious emission	U=±4.54dB (9KHz~30MHz)
	U=±4.91dB (30MHz~1GHz)
	U=±4.89dB (1GHz~18GHz)

13 Appendix A – Setup Photos

Setup photo of radiated emission (9KHz-30MHz)



Setup photo of radiated emission (30MHz-1GHz)



Setup photo of conducted emission (150KHz-30MHz)



14 Appendix B – EUT Photos

External photos

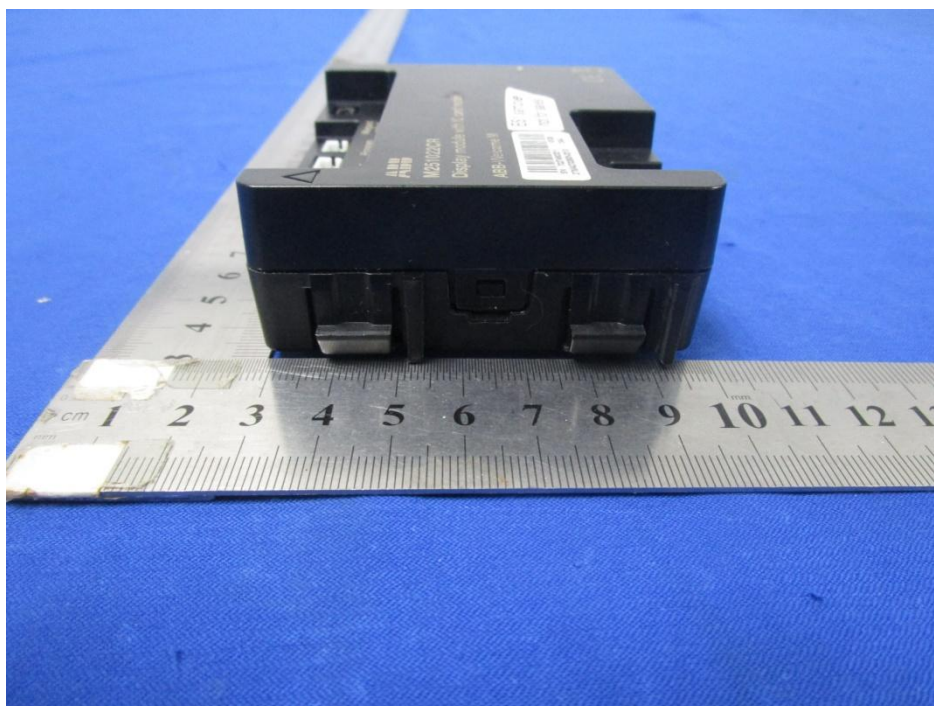
Front View

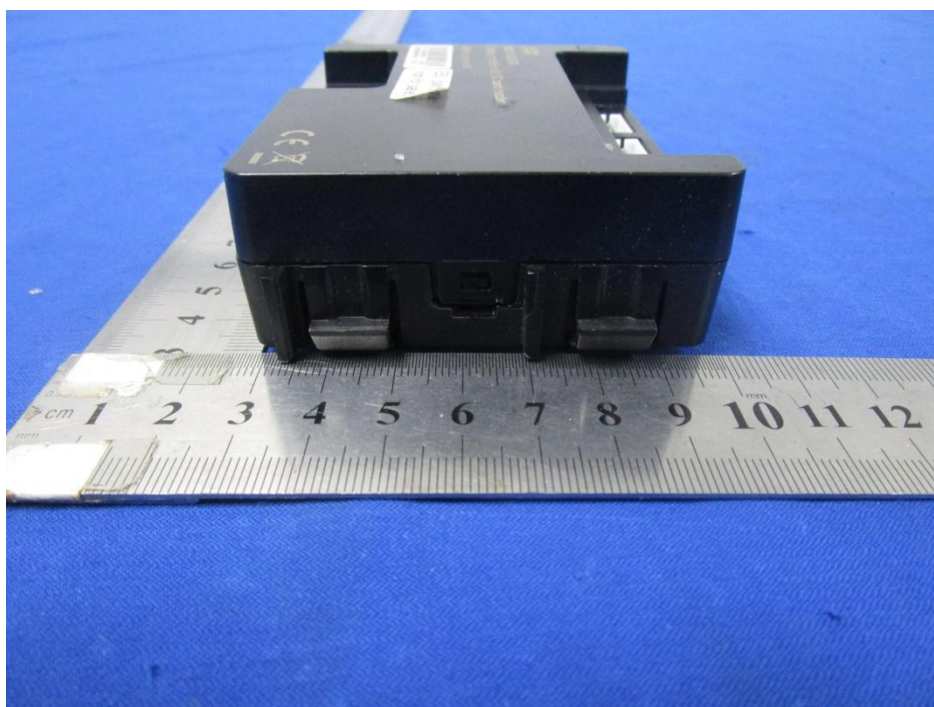


Back view



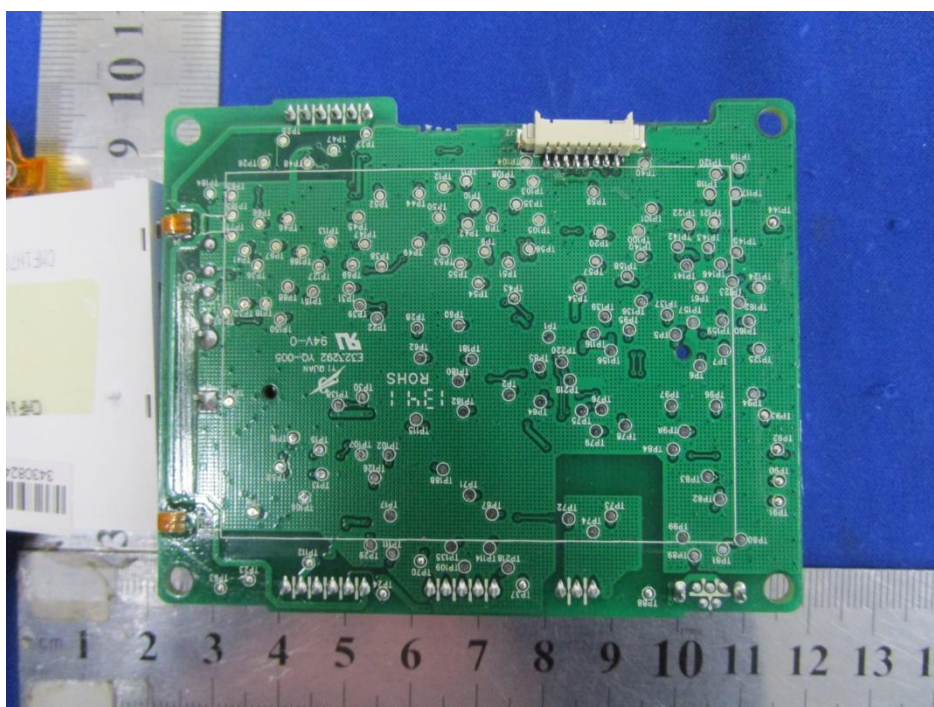
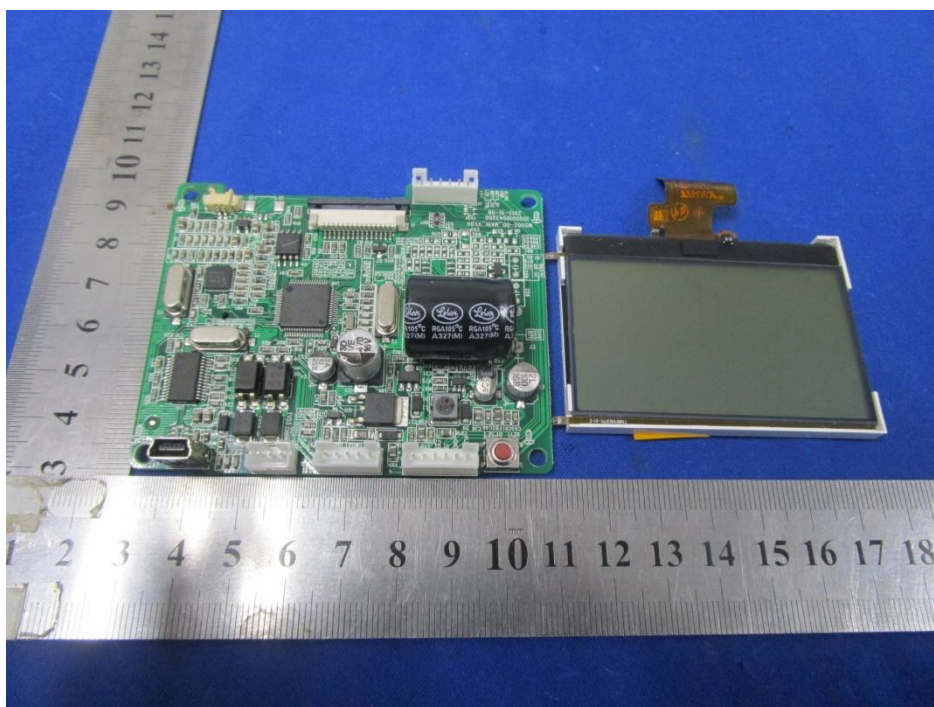
Side view





Internal photos







Antenna photo

